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ABSTRACT

Agroforestry has been defined as a sustainable crop management system which combines the production of forest crops with field crops. In June, 1987, an agroforestry workshop took place in Nyanga, Manicaland, Zimbabwe. This document was prepared to share the information presented at this workshop with other non-government organizations around the world. Included are summaries of the program in general, five presentations, group discussions, and initiatives in Zimbabwe. Appendices include: (1) a list of participating organizations; (2) the workshop program; (3) a list of species suitable for agroforestry; (4) agroforestry project design considerations; and (5) references. (CW)

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AGROFORESTRY SYSTEMS IN ZIMBABWE:

PROMOTING TREES IN AGRICULTURE

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SE 050 647

A Report on the
National NGO Workshop on Agroforestry
Nyanga, Zimbabwe
June 1987

CODEL INC
ENVIRONMENT & DEVELOPMENT PROGRAM

AGROFORESTRY SYSTEMS IN ZIMBABWE:

PROMOTING TREES IN AGRICULTURE

A Report on the
National NGO Workshop on Agroforestry
Nyanga, Zimbabwe
June 1987

Edited by
Helen L. Vukasin

CODEL, Inc. (Coordination in Development)
Environment and Development Program
475 Riverside Drive, Room 1842
New York, New York 10115
U.S.A.
1989

Drawings by Linda Jacobs

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I. INTRODUCTION

In 1985 CODEL surveyed nongovernmental development organizations (NGOs) in East and Southern Africa regarding priority environmental problems and the potential value of a regional workshop for that region. CODEL staff visited Kenya, Tanzania and Zimbabwe following the written survey. NGOs in those countries expressed an interest in such a meeting. It was decided to plan an initial event in Zimbabwe.

In March 1986 CODEL staff hosted a meeting in Harare, bringing together a group of NGOs concerned about environmental issues. At this meeting five organizations were identified as a planning committee called the NGO Environmental Subcommittee. This group included: Christian Care as convener, Catholic Development Commission (CADEC), Environment and Development in the Third World (ENDA) Zimbabwe, Organization for Rural Agricultural Progress (ORAP), and Zimbabwe Foundation of Education and Production (ZIMFEP). Later two umbrella groups were asked to serve on the Committee as consultants: Voluntary Organizations in Community Enterprise (VOICE), and Association of Women's Clubs (AWC).

The NGO Environmental Subcommittee decided that a national workshop on agroforestry with some participation of a few groups from other countries in the region experienced with agroforestry activities would best serve the needs of the NGOs of Zimbabwe. Recommendations from a workshop on forestry in Masvingo in October 1986 supported this idea. The agroforestry workshop, cosponsored by CODEL, took place at the Chitepo Training Center, Nyanga, Manicaland, an area of low wooded mountains in Eastern Zimbabwe, June 7-12, 1987.

This booklet has been prepared in order to share the substantive information presented at the workshop with NGOs in other countries in Africa and other regions of the world.

Agroforestry Defined

Based on the definition developed by the International Council for Research in Agroforestry (ICRAF) agroforestry is defined as: A sustainable land and crop management system that strives to increase yields on a continuing basis by combining the production of woody forest crops (including fruit and other tree crops) with cultivated or field crops and/or annuals, simultaneously or sequentially on the same unit of land, and applying management

practices that are compatible with the cultural practices of the local population.

Agroforestry finds credibility in its traditional roots. Traditional agroforestry represents centuries of accumulated experience of interaction with the environment by farmers without access to scientific information, external inputs, capital, credit, and developed markets. The recognition of the value of combining trees with crops and livestock as a means of conserving soil, increasing the multiple use capacity of the landscape, rehabilitating degraded sites, and diversification to reduce risk is leading development workers to consider introducing or reintroducing agroforestry practices, with improvements based on research and experience.

This interest in agroforestry has grown out of a combination of acknowledging traditional experience and scientific research. Traditional bush fallow and shifting cultivation could be said to be a precursor of the modern understanding of agroforestry. The clearing of woody vegetation for crops for a period of years and re-establishment of forest in the fallow period was a combination of agriculture and forest in sequence that has been practiced in many regions. These methods were sustainable under conditions of low population pressures and long fallow periods. Taungya is an early form of agroforestry in Southeast Asia that introduced tree seedlings planted by foresters combined with growing of crops in the cleared area until the tree canopy provided too much shade. Traditional kitchen gardens have typically been a mixture of shrubs, food crops, and medicinal plants in a multistory arrangement. For some species of coffee and cacao, inter-planting shade trees has been a necessity. Some purposeful combinations of trees and crops practiced today are introduction of fodder trees in fields; dispersing indigenous species in fields for nutrients and fodder, as for example Acacia albida in millet fields; use of trees for shelter belts and hedgerows. Alley cropping is a recently introduced system that involves planting and intensive management of relatively close-spaced rows of nitrogen-fixing trees and shrubs, such as Leucaena and Gliricidia, with a crop such as maize in between.
(Source: Altieri, Environmentally Sound Small-Scale Agricultural Projects)

Ecological Potential of Agroforestry

Agroforestry is a technique particularly suitable for small-scale, low-input farming.

The introduction of woody perennials (trees) can:

- protect crops
- fixate atmospheric nitrogen and carbon
- aerate the soil through tree root action
- prevent soil erosion and subsequent fertility loss by providing vegetative cover, and modifying soil porosity and infiltration rates
- increase organic matter on soil surface by litter fall and root decay
- enhance nutrient cycling and economy
- stabilize soil temperature, resulting in a more balanced micro-climate
- increase permeability and water holding capacity
- trap, through deep roots, nutrients otherwise lost by leaching
- provide food, fuel and fodder
- provide a habitat for wild life

(Source: UNEP Environmental Management Guidelines #11)

See Appendices C, D, and E for information on choosing species, project design considerations and select references.

II. PURPOSE AND OBJECTIVES OF THE WORKSHOP

Purpose

The purpose of the Workshop was to increase the capability of senior non-governmental organization (NGO) planners in assimilating agroforestry activities in their rural development programs; and furthermore, through the exercise of collectively planning agroforestry projects for specific agroecological zones, make a contribution to the draft National Agroforestry Plan. This contribution will reflect the NGOs' capability and competence to contribute effectively to the Plan within the context of their rural development projects.

Objectives

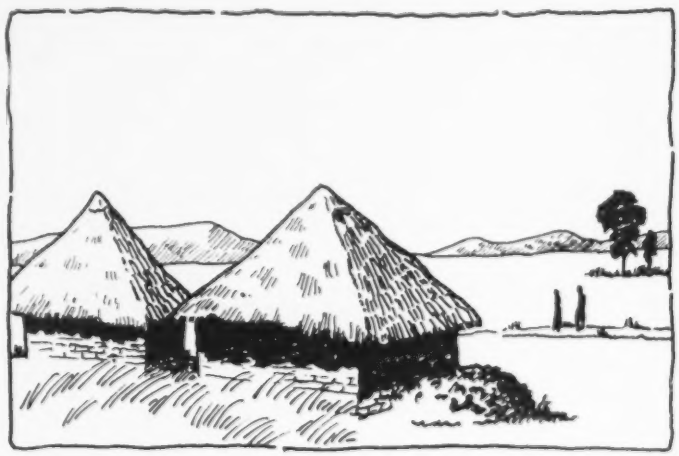
The objectives of the workshop were:

- to acquaint the participants with the various agroforestry systems
- to plan community micro-projects in agroforestry relevant to specific agroecological zones
- to establish a mechanism for networking in agroforestry activities

III. PARTICIPANTS AND SUMMARY OF THE PROGRAM

Participants

Thirty-four persons attended representing sixteen Zimbabwe NGOs, four expatriate NGOs, three from Government, and two from Universities. Zimbabwe representatives came from Harare, Bulawayo, Nyanga, Mutare, Gweru, Chimanimani, Nyazura, Watsomba, and Zvishavane. Thus there were representatives from various agro-ecological zones in Zimbabwe as well as from Kenya and Malawi. A complete list of participating agencies is in Appendix A.



Summary of Program

In summary the program began with a field trip to contrasting ecosystem areas in the Nyanga District (Manicaland). Technical information from government research and extension persons enhanced by reports on work in Kenya and Malawi of NGOs represented at the workshop was presented on day two and three. Small group meetings were organized according to natural areas in which people were working as defined by amount of rainfall. The small groups described the regions and identified the problems these regions face. After sharing reports with the whole group, the small groups worked out appropriate agroforestry systems for their areas using the technical paper prepared for the workshop as a tool. The final sessions of the workshop dealt with mechanisms for carrying out projects that might be based on the results of the small group deliberations. The complete program is in Appendix B.

IV. PRESENTATIONS

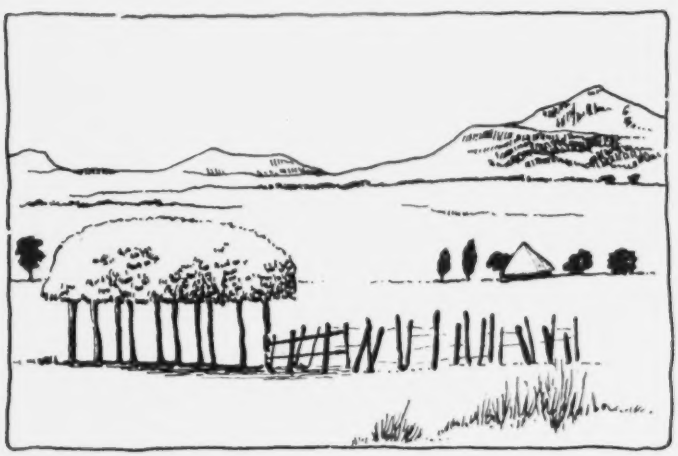
A. Keynote - R.H. Vaughn-Evans, AGRITEX, Zimbabwe

Mr. R.H. Vaughn-Evans, Assistant Director of AGRITEX and Chair of the National Steering Committee on Agroforestry officially opened the workshop. He noted that 40% of the land in Zimbabwe is communally owned and is characterized by disappearing vegetation. There are about 480 extension workers. These extensionists work with 850,000 households. Agroforestry is one of the interventions pursued especially as an holistic strategy. He stressed the need for participation of small-scale farmers and for addressing the problem of incentives for them to do so.

Mr. Vaughn-Evans presented a draft of a model for research and extension for promotion of agroforestry in Zimbabwe. (See diagram on page 6).

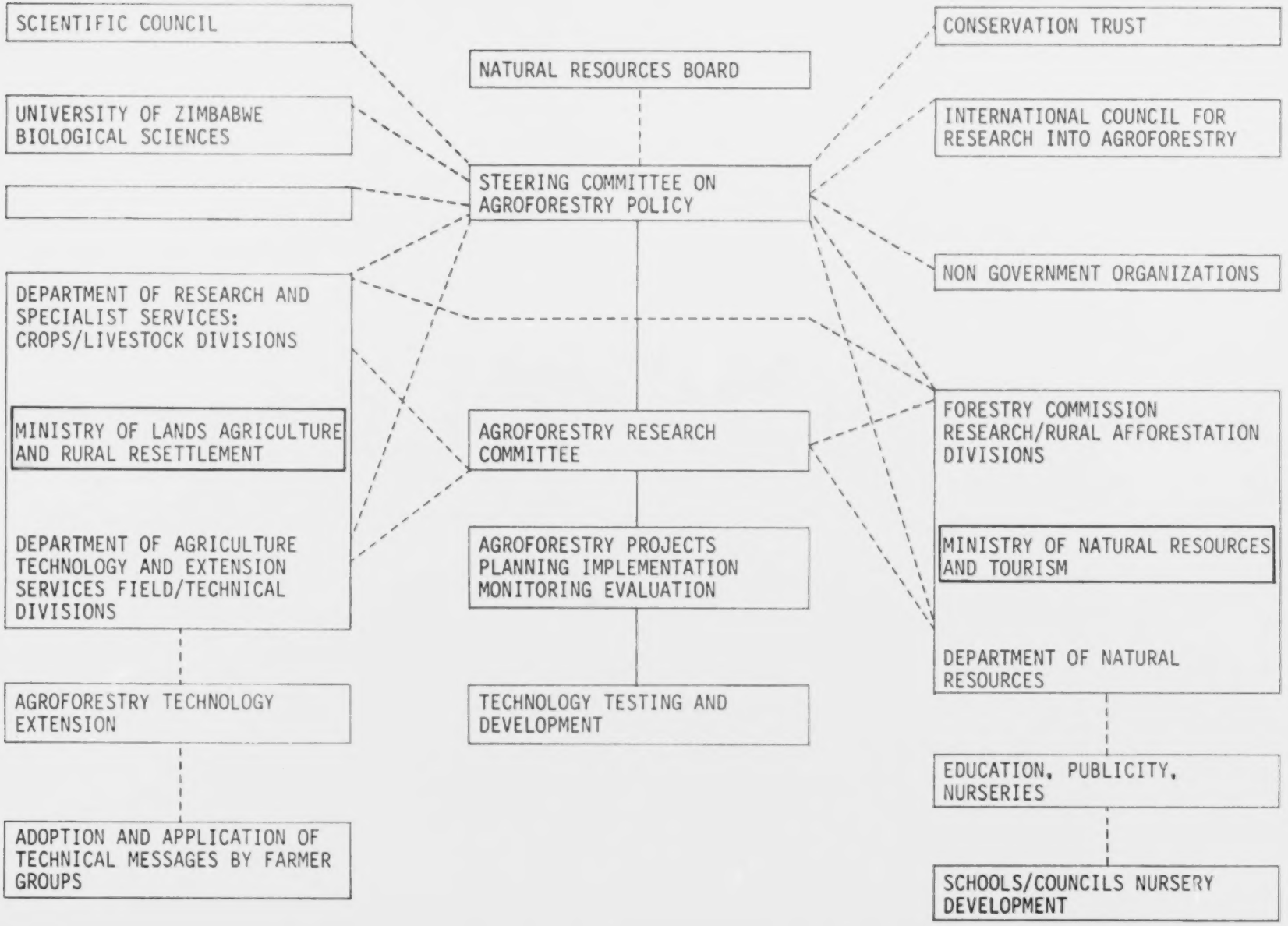
During the question and answer period he made the following points:

- there is a lot of indigenous know how that needs to be tapped
- extension may be a two-way street but it is a long term project to build in the feedback from the field to researchers
- NGOs should proceed to promote agroforestry concurrently with government initiatives



MODEL STRUCTURE FOR RESEARCH AND EXTENSION IN AGROFORESTRY

For Promotion of Agroforestry in Zimbabwe


SCIENTIFIC COUNCIL
UNIVERSITY OF ZIMBABWE BIOLOGICAL SCIENCES
NATURAL RESOURCES BOARD
STEERING COMMITTEE ON AGROFORESTRY POLICY
CONSERVATION TRUST
INTERNATIONAL COUNCIL FOR RESEARCH INTO AGROFORESTRY
NON GOVERNMENT ORGANIZATIONS
DEPARTMENT OF RESEARCH AND SPECIALIST SERVICES: CROPS/LIVESTOCK DIVISIONS
MINISTRY OF LANDS AGRICULTURE AND RURAL RESETTLEMENT
DEPARTMENT OF AGRICULTURE TECHNOLOGY AND EXTENSION SERVICES FIELD/TECHNICAL DIVISIONS
AGROFORESTRY RESEARCH COMMITTEE
AGROFORESTRY PROJECTS PLANNING IMPLEMENTATION MONITORING EVALUATION
FORESTRY COMMISSION RESEARCH/RURAL AFFORESTATION DIVISIONS
MINISTRY OF NATURAL RESOURCES AND TOURISM
DEPARTMENT OF NATURAL RESOURCES
AGROFORESTRY TECHNOLOGY EXTENSION
TECHNOLOGY TESTING AND DEVELOPMENT
EDUCATION, PUBLICITY, NURSERIES
ADOPTION AND APPLICATION OF TECHNICAL MESSAGES BY FARMER GROUPS
SCHOOLS/COUNCILS NURSERY DEVELOPMENT

B. Agroforestry Systems - Newton Spicer, AGRITEX, Zimbabwe

The following is a summary of various combinations of trees, crops and livestock that might address problems in particular climatic zones with specific soil properties and rainfall patterns. The paper was prepared by Newton Spicer, AGRITEX, Government of Zimbabwe, Harare, Zimbabwe based on information from the International Council for Research in Agroforestry, Nairobi, Kenya.

The agroforestry systems described on the following pages are:

Alley Cropping in High Potential Areas
Contour Planting
Fodder Bank - Cut and Carry
Fodder Bank - Grazing
Fruit Improvement
Hedges/Living Fences
Mixed Intercropping
Multistorey Planting of Domestic/Industrial Tree Crops
Tree Planting Around Vleis (Water Catchments) and Dams
Selective Clearing
Woodlot Planting for Fuelwood and Poles

1. ALLEY CROPPING IN HIGH POTENTIAL AREAS

PURPOSE

To provide green manure or mulch for companion food crops. In this way plant nutrients are recycled from deeper soil layers. To provide prunings, applied as mulch, and shade during the fallow. To suppress weeds. To provide favorable conditions for soil macro- and micro-organisms. When planted along the contours of sloping land, to provide a barrier to control soil erosion. To provide prunings for browse, staking material and firewood. To provide biologically fixed nitrogen to the companion crop.

LOCATION

Home gardens and arable lands.

ARRANGEMENT

Hedges along contours.

COMPONENTS

Trees and shrubs suitable for alley cropping should meet most of the following criteria:

- Can be established easily
- Grow rapidly
- Have a deep root system
- Produce heavy foliage
- Regenerate readily after pruning (shaping)
- Have good coppicing ability (cutting branches and trunk so that they will resprout)
- Are easy to eradicate
- Provide useful by-products

Leguminous trees and shrubs, because of their ability to fix atmospheric nitrogen, are preferred over non-legume species. Multipurpose species are generally preferable because they give the alley cropping system flexibility.

MANAGEMENT: ESTABLISHMENT OF TREES AND SHRUBS

Direct seeding is the easiest and cheapest way of establishing hedgerows. Seeds can be planted by hand or with simple planters. However, seedlings from direct seeding are usually very small at the end of the rains and so require extra care and attention.

A cheap and easy way of establishing leucaena hedgerows is by direct seeding in the same row with a crop such as maize. With this method of establishment, there is no extra weeding cost for the leucaena during early growth. The slower growing leucaena can also benefit from residual fertilizer applied to the maize crop.

At the time of maize harvest the leucaena should have reached a height enabling it to outgrow the weeds.

Transplanting is used when direct seeding does not give desirable results or for seeds that rapidly lose their viability during storage. Generally transplanted seedlings are tall enough to have a competitive edge over weeds and require less care and protection during early development.

Cutting is an alternative method for establishing some species. On strongly acidic soils, soil amendments, particularly phosphorus and lime, are needed for good growth of leucaena and gliricidia. Innoculations with compatible rhizobium strains is generally recommended for rapid establishment.

ALLEY WIDTH

Four meters between hedgerows is quite satisfactory for continuous food crop production with or without the use of a tractor. Within the hedgerows, trees and shrubs can be spaced 25 to 100 cm. apart depending on the species.

PRUNING

During cropping, pruning of the hedgerow is necessary to avoid shading of the companion crop. East-west orientation of the hedgerows also minimizes shading. Pruning can be done manually using a sharp cutlass or slasher. A dull blade that strips the bark will delay coppicing (regrowth) and result in the death of the plants. Pruning intensity varies with the shrub or tree species. As a general rule, the lower the hedgerows and the taller the crop, the less frequently is pruning required. Fast growing plants such as leucaena and gliricidia, require pruning about every six weeks during cropping. Too low and too frequent pruning of the hedgerows should be avoided as it may result in dieback.

STAKING AND VINE SUPPORT

Stems produced by trees and shrubs grown in the hedgerows can be used for supporting climbing plants such as beans. Major methods of using these stems are:

In-situ live staking
In-situ dead staking: The stems are killed close to the ground by girdling and used as support for the climbing crop planted close by.
Cut and carry staking: The stakes are cut and used outside the alley cropping area.

TILLAGE

Conventional tillage involving plowing and harrowing is not required. However, occasional shallow tillage between the hedgerows that will partially trim the surface roots of the trees or shrubs is recommended.

WEED CONTROL

The control or suppression of noxious weeds, a major function of the bush fallow, is also a major attribute of alley cropping. Shading by trees or shrubs during the fallow suppresses most weeds. The prunings, applied as mulch, also suppress weeds.

2. CONTOUR PLANTING

PURPOSE

To restore/improve soil nutrient and organic matter status. To reduce soil and water run-off. To spread the risk of crop failure during extremely dry seasons by moderating the effects of excessive moisture evaporation on exposed land. To add wood products for home consumption or sale.

APPROPRIATE ENVIRONMENT

Poor or easily depleted soils.
Sloping (erodable) land as well as non-erodable land.
Medium to high population density.

APPROPRIATE FARMING SYSTEM

Permanent crop cultivation, medium to small farm size.
Medium to high labor input per unit of land.

PHYSICAL LAYOUT

Hedges on contours; either above, along, or below the contour bank. Also trees laid out at a wide spacing along the contour line.

ESTABLISHMENT

Fast growing species can be established at the start of the growing season which gives them the opportunity to establish while livestock are being kept out of the arable areas.

SPECIES

Fruit and fodder species should be considered; also see the lists for the other interventions.

Acacia albida
Leucaena leucocephala
Gliricidia sepium

3. FODDER BANK - CUT AND CARRY

PURPOSE

To improve fodder availability and quality, particularly during the late dry and early wet season. To restore/improve soil nutrients and organic matter status.

APPROPRIATE ENVIRONMENT

High population density.
Nearby markets for livestock products.

APPROPRIATE FARMING SYSTEM

Small farm size.
Intensive land use, kraal (animal enclosure) feeding system.
High labor input per animal.

LOCATION AND LAYOUT

To facilitate ease of fencing, pure stands (blocks, strips, lines) of trees (mainly leafy fodder) are planted near cattle kraals (enclosures), in homestead gardens, in arable lands and grazing areas, along watercourses and around vlei (water catchments) margins.

SPECIES

See the list below under the Fodder Bank intervention.

4. FODDER BANK - GRAZING

PURPOSE

To improve fodder availability and quality in low to medium population density areas. To restore/improve soil nutrient and organic material status.

LOCATION

In grazing areas: on hills (especially pod species), on uplands and along watercourses and on vlei borders (where there is a danger of frost foliar species should not generally be planted).

PHYSICAL LAYOUT AND UTILIZATION

Mixtures of trees (pods and leaves) and grasses (fenced) planted in blocks. Pod and foliar species planted in hedges. Scattered trees protected by thorns. The pod species provide a feed supplement for cattle during the early rains.

SPECIES

Species selected must be climate and soil adapted as well as having other attributes such as palatability, high protein content, ease of establishment, etc. Establishment by direct seeding, transplanting or truncheon setting. Pod tees established on hills and uplands to seed from August to December; self-seeding in vleis must be tolerant of up to 6 months waterlogging and should not have such an enormous water uptake rate as to have a detrimental effect on the hydrology of the area. Foliar species should either pollard (harvest branches) or shed well or maintain the form of a low shrub.

Acacia albida
A. arabica
A. gerrardi
A. giraffae
A. litakunensis
A. nilotica
A. sieberana
A. schweinfurthii
A. tortilis
A. woodii
+ other Acacias
Adansonia digitata
Afzelia quanzensis
Albizia amara
Bauhinia macrantha
B. petersiana
Boscia albitrunca
Brachystegia boehmii
B. spiciformis
Burkea africana
Cassia abreviata
C. laevigata
Casuarina cunninghamiana
Colophospermum mopane
Combretum apiculatum
C. hereroense
C. imberbe
Cussonia spicata
Diohostracys cinerea
D. glomerata
Diospyros quiloensis
Diplorhynchus condylocarpon
Grewia flavescens
G. monticola
Hypphaene benequellensis
Julbernadia globiflora
Kigelia africana
Leucaena spp.
Morus spp.
Piliostigma thonningii
Salix spp.
Sclerocarya caffra (birrea)
Securidaca longepedunculata
Strychnos innocua
Syzegium cordatum
Swartzia madagascariensis
Terminalia sericea

5. FRUIT IMPROVEMENT

FUNCTION

To improve nutrition, produce fruit for sale, provide shade and firewood.

LOCATION

In the homestead arable area and garden.

ARRANGEMENT

Scattered trees, planted near the home to allow for protection from animals. Also planted around the homestead boundary.

COMPONENTS

Availability of improved fruit varieties. Adequate extension on choice of varieties and management, e.g., propagation, grafting and budding, planting, mulching, watering and control of weeds, pests and diseases.

MANAGEMENT

Selection and acquisition of available fruits most suited to local conditions.
Adequate care of seedlings prior to planting.
Preparation for planting - square holes.
Mulch, compost and/or compound fertilizer and watering routine.
Development of local grafting and budding skills.
Development of appropriate and available weed, pest, and disease control methods.
Development of other management skills such as harvesting, processing (drying), storage, and marketing.

6. HEDGES/LIVING FENCES

PURPOSE

Live fences or hedges provide an alternative to fencing for:

a. The demarcation of boundaries; for example between/around schools, farms and fields (particularly paddocks in grazing schemes) and community areas.

b. The protection of areas from the ravages of free grazing livestock; for example crop lands, orchards, nurseries, woodlots, dams, protein banks (grazing schemes), vegetable gardens and homes.

In addition hedges can offer secondary benefits such as reducing the adverse influence of wind and they provide not only organic material to adjacent soils but also multiple tree products (firewood, poles, fruit, fibre, medicines, etc.) to the local community.

APPROPRIATE ENVIRONMENT

Medium to high population density.
Presence of animals in the area.

APPROPRIATE FARMING SYSTEM

Small to medium farm size.
Permanent crop cultivation.

PHYSICAL LAYOUT

A. Live Poles: Truncheons (coppiced trunks) set in the place of conventional poles generally with wire strung between the poles.
B. Hedges: Usually offset double row combinations of appropriate plants at various spacings (often requiring space to spread).

Select one or two row layout.
a. One-row layout should consist of a single row of plants with a varied spacing, e.g. 15 cm, 30 cm and 50 cm within the row to establish which is best for the locality.
b. Two-row layouts consist of a double row of plants, the two rows being offset against each other.

Select inter-row spacing: 25 cm, 50 cm and 75 cm spacing should be considered.

Select intra-row spacing: again, 15 cm, 30 cm and 50 cm will test the expected range.

It is often desirable to combine different species. The different growth form of the species available should be noted and combinations which promise to complement each other in providing a livestock proof barrier should be selected.

For example, truncheons of "narrow, spiney" trees such as Commiphora africana could be interplanted with a combination of "climbing" species such as Acacia ataxacantha and Toddalia asiatica and "bushy" species like Acacia erubescens and Crissa bispinosa. Gaps in the fence can be filled in with plants such as sisal (Agave americana) or barbed wire.

ESTABLISHMENT

In order to ensure maximum survival and growth it is suggested that the "fence" line be cultivated before planting. Fertilizer in the form of compost and/or compounds of nitrogen and phosphorous should be applied.

The "hedge should be planted soon after the start of the rains; supplementary watering should not be necessary unless a long dry spell follows. Failures should be replaced as soon as possible.

TRUNCHEONS

These should be taken from:

a. deciduous species late in the dry season before the sap has started to rise and before the new buds and leaves have started to appear
b. evergreen species during the early part of the rainy season

Truncheons (cuttings for replanting) should not be taken when the tree is in fruit or flower. They can be of varying length but should be solidly planted in holes up to 75 cm deep. The bottom 10 cm or so can be beneficially filled with compost with a 10-15 cm layer of sand on top of it. The truncheon is then set firmly into the hole, with its end embedded into the sand. A simple "live fence" can be established by stringing wire along a line of truncheons.

PROTECTION

Protection from livestock must be given to the young plants during the establishment period. The "hedge" may be underplanted within a traditional "scrub" fence constructed from thorn branches; as the "scrub" fence rots away it is replaced by the live fence growing through it.

MANAGEMENT

As a result of their often prickly nature and spreading form, species used for "hedges" have potential to become very serious pests under certain conditions. The introduction of any new species to an area must be carefully controlled and monitored if this is to be avoided.

The growth form of the "hedge" must be carefully managed if it is to provide an effective barrier to livestock; and also if it is NOT to compete with adjacent crops for space, light, moisture and nutrients. The aim should be to produce a "wall" of vegetation from top to bottom. This is achieved by snipping off the tip of the leading shoots at planting and by regular trimming from the time the seedlings reach a height of +/- 30c. This will reduce competition for space and light with adjacent crops. Whether a "hedge" is clipped into vertical sides and flat top or into pyramidal shape is a matter of choice. The latter has the advantage that the sides receive more sunlight and are therefore not so liable to become sparse and straggly near the base.

Nutrient and moisture competition can be reduced by "trenching" to a depth of about 75 cm between the crop and the fence.

SPECIES (Live Fences)

	Seed Ripening Dates (+/-)
Climbers:	
Acacia ataxacantha	June - October
A. schweinfurthii	March - June

A. pentagona	
Bougainvillia glabra	(Cuttings)
Caesalpinia decapetala	
Capparis tomentosa	December - March
C. sepiaria	April - May
Pterolobium stellatum	
Rubus rigidus	
R. nivea	
Toddalia asiatica	

Bushes or Shrubs:

Acacia erubescens	September - January
A. flecki	January - May
Capparis tomentosa	December - March
C. sepiaria	April - May
Cardiogyne africana	August - October
Carissa bispinosa varieties: acuminata, bispinosa and edulis	May - October (depending on rainfall)
Dichrostachys cinerea	October - January
Devyalis caffra	November - January
D. hispidula	November - January
D. zeyheri	November - May
Prosopis juliflora	
P. chilensis	

Narrow Shaped Trees:

Acacia nilotica	March - September
Commiphora spp.	September - November
Devyalis spp.	November - January (- May)
Euphorbia caducifolia	
E. tirucalli	
Prosopis spp.	

Large Crowned Trees:

Acacia albida	
A. ataxacantha	June - October
A. schweinfurthii	March - June
Erythrina abyssinica & other erythrinas	May - October
Fiscus spp.	Some found all year but mostly April - December
Kirkia acuminata	January - November
Lannea discolar	September - October
L. stuhlmannii	November - March
Pterocarpus angolensis	September - October (also possibly January - April)
P. rotundifolius	November - January (- April)
Trichilia emetica	

Miscellaneous:

Agave americana

Truncheons:
All Commiphora spp.
Erythrina abyssinica
Kirkia acuminata
Lannea discolor and L. stuhlmannii
Pterocarpus rotundifolius and
P. angolensis
Fiscus spp.

7. MIXED INTERCROPPING

PURPOSE
To restore/improve soil nutrients and organic material status.

PHYSICAL LAYOUT
Scattered trees.
Contour planting.

APPROPRIATE ENVIRONMENT
Poor or easily depleted soils.
Flat to gently sloping land.
Medium population density.

APPROPRIATE FARMING SYSTEM
Permanent crop cultivation, medium to small farm size.
Medium labor input per unit of land.
No ox cultivation (at high tree densities).

SPECIES
Acacia albida
Prosopis chiliensis
Sesbania grandiflora
Balanites elitisia

8. MULTISTORY PLANTING OF DOMESTIC/INDUSTRIAL TREE CROPS

PURPOSE
To produce tree products to meet household requirements and/or to reduce cash expenditures and/or to add to cash income.

PHYSICAL LAYOUT
Home garden.
Upper story of productive trees in hedges.

APPROPRIATE ENVIRONMENT
High population density.
High rainfall.

APPROPRIATE FARM SYSTEM

Small farm size.
High labor input per unit area.

SPECIES

Fruit, fodder and other species identified by the local community as having particular value.

9. TREE PLANTING AROUND VLEIS AND DAMS

PURPOSE

To reduce the damage to vleis and dams which is caused by livestock. To add wood products for home consumption or sale.

PHYSICAL LAYOUT

Strip - woodlots.
Mixtures of trees and grasses. Narrow spacing, multistory.

APPROPRIATE ENVIRONMENT

High population density and/or presence of animals in the area.

APPROPRIATE FARM SYSTEM

Small to medium farm size.
Permanent crop cultivation.

SPECIES

See the live fence and erosion control species lists on pages 9, 13-15.

10. SELECTIVE CLEARING

PURPOSE

To conserve functional indigenous vegetation to ensure future supplies of woodland products and germ plasm.

PHYSICAL LAYOUT

Individual trees in croplands at low densities.
Strips of trees and shrubs left growing around newly opened plots, between fields and along roads, tracks and watercourses.

APPROPRIATE ENVIRONMENT

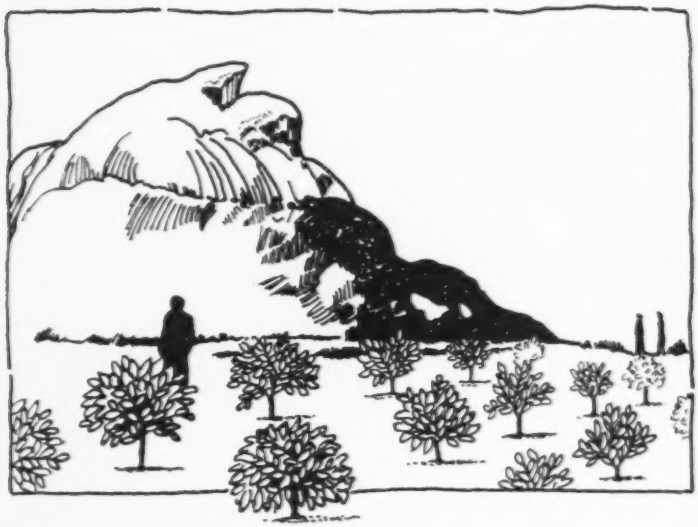
Areas with substantial acreage of indigenous woodlands.
Low population density.
Resettlement areas.

APPROPRIATE FARM SYSTEM

Medium to large farm size.
Low labor input per unit area.

SPECIES

Useful or beneficial species.



11. WOODLOT PLANTING FOR FUELWOOD AND POLES

PURPOSE

To produce fuelwood/poles to meet household and/or household industries requirements and/or to add to cash flow.

PHYSICAL LAYOUT

Woodlots (should be fenced; where possible "live fences" should be established within the protection offered by the fence).
Standard spacing 2.5m x 2.5m. Wider between row spacing and a correspondingly closer inter-row (along the contour) spacing allows for ease of intercropping. Firebreaks recommended.

APPROPRIATE ENVIRONMENT

Deforested areas and all areas with a market for poles and/or firewood.

APPROPRIATE FARM SYSTEM

Medium to large farm size.
Low to medium labor input per unit area.
Tobacco farms (for barn construction as well as curing).
(Also small industries e.g., brick works, mines, etc.).

SPECIES

Eucalyptus spp.
Jacaranda mimosifolia
Bauhinia galpinii
Leucaena leucecephala

C. Experiences from an Agroforestry Woodland Pilot Project Zvishavane District, Zimbabwe

(Summary of Paper Presented by Mathou Chakavanda, Project Director and Ian Scoones, University of Zimbabwe)

Background

The project is based on the Mazvihwa-Bungowa communal area in the Zvishavane District. It is concerned with community based management of indigenous tree resources and explores the potential for participation of the community in managing tree resources.

The woodland types in this area vary from those on heavy soil plains to sandy soils in the hills plus patches of riverine woodland. The project has evolved out of research being carried out in the area on development problems concerning agriculture, livestock, and welfare. The research is based on a human ecological approach using local knowledge to define priorities for development. Local people identified trees as an important issue and the project arose as a result of local people's demands for some action particularly concerning indigenous trees around homes, in fields, and in the communal woodland area.

The research began with an ecological study of existing tree resources. This was followed by a series of studies based on local knowledge of tree ecology and potential use. Some of the areas reviewed were:

- the uses of each tree species - firewood value, timber use, fruits, browse, and so forth
- patterns of firewood use derived from the kind of wood stoves currently in operation
- the extent and uses of trees in fields
- trees used around houses: shade, wind breaks, fruit trees
- fencing practices and the possibilities for live fencing
- the spiritual-magical role of trees
- local rules and management practices in communal woodlands
- local knowledge on and attitudes toward planting indigenous trees

One of the general conclusions of the research was that people refuse to take a partial view. Trees are seen as a multiple use resource entering many aspects of rural life. Trees are also acknowledged as important to the overall ecosystem for preventing erosion, assisting livestock and even encouraging rainfall.

The perceptions of local people are often in sharp contrast to existing policy. For instance, range management specialists have been urging the clearance of "bush" to assist livestock production, ignoring the other uses of trees in communal grazing areas, undervaluing browse and not considering the beneficial effects of some trees on the grass layer. Similarly there has been a long running-conflict between locals and agricultural extension workers who have urged the removal of all trees from fields. The government has been seen as against trees and when tree planting is encouraged only a single species is offered. Eucalyptus is valued for roofing poles but people have found it very difficult to sustain in dryland areas.

It was clear from the local workshops that people knew what they wanted but a number of constraints lay in their way. These were first, that communities had no access to seedlings and doubted their abilities to generate seedlings. Secondly, people lacked the effective organization and, more significantly, they lacked the confidence to plan and implement tree planting for themselves. The pilot project has tried to overcome these constraints by 1) starting an experimental nursery for indigenous trees and 2) developing a methodology for local level planning and implementation of tree planting and management.

Virtually no documented information exists on the germination and growth requirements of indigenous trees so the nursery has started very much on an experimental basis. So far there has been complete success in germination and local people's contact with the nursery has helped to dispel early scepticism about the possibilities and has prompted many requests from other areas for assistance with similar projects.

The tentative conclusion of the scientific study, supported by observations made by local farmers in workshop discussions in a number of areas, are that in fair to good rainfall years the major constraint to crop yield on sandy, dystrophic soils (soils lacking nutrients) is the level of fertility. Leaf humus derived from the trees results in a positive affect on yield. In poorer rainfall years or when falling on fertile soils the benefits of leaf humus are through water conservation effects promoted by the micro climate under the tree canopy.

Clearly there is much scope for further investigation of these properties and the research highlights that important innovation in agroforestry can be "discovered" by capitalizing on indigenous knowledge and complementing this with conventional research.

Project Description

Central to the project approach is the method of participatory planning for the use of community resources. The model to be used and its articulation with existing government development structures is outlined below.

The larger project will have four project areas of four wards each: Mazvihwa-Bungowa, Runde, Chivi North, and Chivi South. Each ward consists of, on average, six Village Development Committees (VIDCOs), of approximately 100 households each. An average sized ward is about 100 sq. km. The project area sites were chosen to get a range of environments, degrees of woodland stress and communities with different organization, cohesion, and structure. Each project has one community worker. The project is expected to provide a demonstration. An important component is the research element that will benefit from project experience.

In every ward a nursery is set up to respond to requests for trees from that area as outlined in workshops and discussions facilitated by the community worker. Each nursery will produce about 5,000 seedlings per annum as well as information on truncheon planting, advice on germination of seeds at home, and other needed assistance. Each ward decides who will operate the nursery. It is expected that they will be run by schools, cooperative garden groups or individuals. The choice is determined by willingness as well as the necessity to have a suitable site close to permanent water supplies. A number of such nur-series were set up in 1987 without any project back-up using brushwood-fencing "chibuku" beer cartons and other local materials. When funding is available the basic minimum of equipment will be provided to the nurseries. It is hoped that the nurseries will be self-sustaining by selling seedlings to individuals while retaining others for free distribution to VIDCOs for planting programs. Linked to each nursery there is a monitoring aspect--data will be collected on germination rates, seedling survival, disease and pest problems, and other appropriate information.

Each community worker is expected to introduce the project to two wards each season. A community worker season plan would look something like this: During the dry season hold ward meetings introducing the project; identify nursery sites; get a feel for local priorities; generate enthusiasm and debate on tree resource issues. One VIDCO is to be visited each week. A general meeting to be held at the beginning will be followed by a general assessment of woodland problems and priorities in the VIDCO area through discussions with

locals during the week. At the end of the week a meeting is held with VIDCO committees to discuss the VIDCO tree resource plan for that year. This planning process is central to the project approach. The resource plan contains two complementary elements: research and training.

The whole project is to be coordinated by one locally resident person. He will have a key role in research and training linked to the project. Research includes:

- monitoring the success of the participatory planning approach in different communities
- monitoring of nursery germination rates, and success with planting seedlings in sampled areas
- monitoring of woodland change within the whole project area by a structured sampling approach

From the experience so far we would argue that:

i) NGOs have an important role to play in the development of community forestry initiatives in Zimbabwe. By linking up with concerned government bodies, NGO projects can act as crucial catalysts in policy development in this new area of development in Zimbabwe's communal areas.

ii) Projects need to adopt a participatory approach to local planning that is responsive to local priorities, and relate to differences in local environments.

iii) Projects need to recognize the multiple uses of trees and the need for a diverse woodland resource. They need to take a holistic view of resource management that recognizes the role of trees as part of the total agroecosystem.

iv) Projects need to include a research element. There is a lot to be learned from project experience--from basic biology of indigenous trees to comparisons of different approaches to community planning and management for communal area resources. There is a lot to be gained from linking up with existing research capacity in the country as in the ENDA-Zimbabwe - Zvishavane Research team - University of Zimbabwe collaboration.

The following pages contain detailed information about the results of the participatory research on indigenous species.

PLANTING INTERVENTIONS IN GRAZING WOODLAND ON HEAVY SOILS

SPECIES	BROWSE VALUE	TIMBER/FIREWOOD	ECOLOGICAL SITUATION	PROPAGATION
Colophospermum mopane "mupane"	excellent leaves at all times of the rainy season, even when fallen, especially during wettish weather	excellent general use wood, construction and tool handles, especially high quality firewood	decimated by mine contractors and later depleted by agricultural expansion and the fact that Acacia colonizes abandoned fields better	seed scattering in abandoned fields and acacia woodlands
Combretum apiculatum "mubhondo"	excellent as very early-to-sprout leaves that tanninate slowly and can even be eaten fallen; cut for stock in droughts even branchlets eaten	good general use timber; exceptionally good firewood even used fresh cut	under pressure as tends to be preferentially cut for stock and firewood, people want as many as possible; loosing out to acacia	as above and planting of seedlings
Combretum hereroense "mutechani"	good, fairly early and quite edible on tree	good timber and firewood	under some pressure from cutting and loosing out to Acacia but also does well in riverine areas	as above
Combretum imberbe "mutsviri"	fair but not important as tree is generally very tall	hardest construction wood of all; very good firewood.	under pressure for same reason as above but big ones strongly protected	as above
Dichrostachys cinerea "mupangare"	pods valuable for cattle but give milk a slight odor	good general use; timber important; firewood	not particularly stressed; cosmopolitan and capable of colonizing--simply more wanted in some areas	seed scattering in abandoned fields and acacia woodlands

SPECIES	BROWSE VALUE	TIMBER/FIREWOOD	ECOLOGICAL SITUATION	PROPAGATION
Sclerocarya caffra "mupfura" snyonym for Sclerocarya birrea subspecies caffra	leaves and fruits eaten but of minor importance	timber many special uses; good for bricks but too smokey for firewood	actively preserved and sometimes planted; males and poor fruiters are usually only ones cut; fruit is very valuable indeed although now getting rarer people want as many as possible	seedlings and truncheons
Grewia monticola & G. bicolor "mutehwa"	shrub form and continued high palatability make it highly valued	timber;a number of general uses; fairly good firewood	decimated on productive soils as unable to coppice; now found only in unfarmed areas; reasonable fruit	seedlings, but germination experiment needed
Lannea stuhlmannii "musvimwa"	eaten all year round, even when fallen, cut in drought for cattle	timber;a variety of important and general uses; good for burning bricks not firewood	well protected for its many uses; restricted to rocks and termitaria; people want as many as possible	seedlings in appropriate sites
Acacia nilotica "mujerenga" please be aware that many different varieties exist	pods a very valuable cattle food; dispute over whether this taints milk; leaves eaten by goats	useful timber and a good quality firewood; excellent for brushwood fencing	initially expanded rapidly at expense of mopane woodland, now being eclipsed by Acacia tortilis	scatter seeds
Acacia tortilis see above note	pods phenomenal goat fodder and leaves also very important	timber not useful but firewood fair quality; excellent brushwood fencing	expanding rapidly under influence of goats	scatter seeds

PLANTING INTERVENTIONS IN GRAZING WOODLAND ON SANDY SOILS

SPECIES	BROWSE VALUE	TIMBER/FIREWOOD	ECOLOGICAL SITUATION	PROPAGATION
Julbernardia globiflora "mutondo"	one of the more important species on these soils	provides construction as well as general purpose timber and bark fiber; good firewood	under pressure in certain areas (e.g. thoroughly destumped old fields) but coppices extremely well	seeding very difficult; research needed on rock cuttings
Combretum fragrans "mupwezha"	good all year round and cut for cattle during drought	a useful timber and firewood	seen as valuable tree that should be increased	probably seedlings
Lannea stuhlmannii "musvimwa"	eaten all year round, even when fallen; cut in drought for cattle	timber a variety of important and general uses; good for burning bricks not firewood	well protected for its many uses; restricted to rocks and termitaria; people want as many as possible	seedlings in appropriate places
Boscia angustifolia "mubarebare"	leaves of this shrub eaten, especially in droughts	can be used for short construction poles; excellent firewood	under fairly heavy pressure for wood; found in rocky hills so not affected by agriculture	seed scattering and seedlings
Bolusanthus speciosus "musvingamhara"	not important	generally useful wood as highly durable; very good firewood	uncommon in most areas so people want it increased to provide firewood	seed scattering and seedlings
Afzelia quanzensis "mukamba"	leaves, flowers and pods all very good, especially for goats; branches cut for cattle in drought; leaf humus improves surrounding grass	valuable for door furniture and other uses; not used as firewood	people also eat the leaves; very highly valued and protected tree that people would like to see more common	perhaps truncheons; seedlings easy

SPECIES	BROWSE VALUE	TIMBER/FIREWOOD	ECOLOGICAL SITUATION	PROPAGATION
Bauhinia galpinii "mufomwe"	shrub with good quality cattle browse	roots and branches for weaving baskets	colonizes in abandoned fields; more wanted	seed scattering
Sclerocarya caffra "mupfura", please be aware that many different varieties exist	leaves and fruits eaten but of minor importance	timber, many special uses; good for burning bricks but too smokey for firewood	actively preserved and sometimes planted; fruit very valuable indeed; as many as possible are wanted	seedlings and truncheons
Dichrostachys cinerea "mupangare"	pods valuable for cattle but give milk slight odor	good general use; timber;and valuable firewood	cosmopolitan colonizer but more wanted	seed scattering
Cocculus hirsutus "musisi"	creeper on bushes; cattle and goats browse heavily	stems used for basketry	people also eat leaves and want more of it	seedlings under bushes
Lippia javanica "zimbani"	shrub browsed by cattle in drought	not used	wanted as drought fodder reserve	seed scattering
Euphorbia tirucalli "rusungwe ngocha"	as above	not used	as above	truncheons
Opuntia megacantha "dhorofia"	as above	not used	as above	truncheons and seeds

PLANTING INTERVENTIONS IN RIVERINE WOODLAND IN HEAVY SOIL PLAINS

SPECIES	BROWSE VALUE	TIMBER/FIREWOOD	ECOLOGICAL SITUATION	PROPAGATION
Diospyros mespilifarmis "musumha"	useful all year round; sometimes cut for cattle in drought	can be used for a number of general purposes including construction	preserved for its valuable fruit in general only cut if poor fruiter or far from people; more wanted	seedlings
Combretum hereroense "muteshani"	good browse, sprouts early and stays palatable	a good timber and firewood	under mild pressure	scatter seeds; seedlings
Combretum microphyllum "gangwamusero"	particularly valuable all season; browse brush	no use	common but more wanted	seedlings and seed scattering
Acacia ataxacantha "rukato"	eaten by cattle when leaves young and fresh; by goats at all times; low straggling bush	no particular use	as above	seedlings and seed scattering
Ziziphus mucronata "muchecheni"	favored as palatable and low; occasionally cut in droughts	useful general timber; fairly good firewood	protected as fruit tree but more wanted	seedlings
Cocculus hirsutus "musisi"	creeper on bushes with highly edible leaves for cattle and goats	stems used for basketry	people eat the leaves; more wanted	seedlings under bushes

SPECIES	BROWSE VALUE	TIMBER/FIREWOOD	ECOLOGICAL SITUATION	PROPAGATION
Acacia galpinii "mukaya"	leaves (when in reach), and to some extent pods, eaten by stock	useful general wood; good firewood	some large ones died or were cut; others preserved as big trees; more wanted to maintain existing woodland; not totally restricted to rivers	seedlings
Acacia albida "mupumbu"	early leafing provides excellent browse if tree small; pods liked by all stock	not much use as wood or firewood	not common, said to be slowly increasing; valued as large tree and for stock but less than A. galpinii; only found by rivers	seedlings

PLANTING INTERVENTIONS IN WETLANDS IN SANDY AREAS OF HILLS

SPECIES	BROWSE VALUE	TIMBER/FIREWOOD	ECOLOGICAL SITUATION	PROPAGATION
Ficus spp "muonde"	important where tree low or small; fallen fruits eaten; leaf humus improved grass in area	woods useful for furniture etc. but rarely cut; no use for fuel	increasing under protection but so valuable many more wanted	perhaps seed; experiments with root cuttings
Kigelia africana "mumveva"	good browse including flowers and fruits when still fresh	limited use for drums etc.; useless for fuel	more wanted	truncheons or root cuttings and perhaps seed; experiments needed
Ziziphus mucronata "muchecheni"	favored as browse as low and platable; occasionally cut in droughts	useful generally; timber; fairly good firewood	protected as fruit tree but more wanted	seedlings
Parinari curatellifolia "muchakata"	fruit relished by stock if left by people; improve grass area	important wood uses; except for burning bricks under special conditions, not used for fuel	highly protected and more wanted	seedlings easy but problem is keeping them alive

TREES FOR LIVE FENCING

SPECIES	ECOLOGICAL ZONE	PROPAGATION	NOTES
Commiphora mossambicensis "munyera"	light sandy soils	truncheon	strikes very well, commonly used e.g., as washing line poles; spined to make better fencing
Commiphora mollis "mukuhunu"	light sandy soils	truncheon	strikes well, not spined so suitable for fence poles especially
Lannea discolor "mugan'acha"	all	truncheon or seed	strikes very well; a fruit tree with useful timber; non-spined; fence poles especially
Sclerocarya caffra "mupfura", please be aware that many different varieties exist	all	truncheon or seed	valuable fruit and multi-purpose wood; spined, especially good as fence poles
Kirkia acuminata "mubvumira"	rocky areas	truncheon or seed	not suitable near crops as affects them badly or otherwise spineless fence pole
Acacia tortilis "muunga"	heavy soils	seeds in goat manure	dense spiny fence produced, excellent browse and good firewood bi-products; competes with crops for water and nutrition, say farmers
Euphorbia tirucalli "ngocha" "muhedge"	all	truncheon	dense hedge easy to establish, so common but not spined and rather weak; reputed to harbor snakes and vermin
Agave americana "sisal" "musharamanda" "mufibre"	all	transplant suckers and seeds	spined and impenetrable; providing fibre as bi-product; common; difficult to control and occupies large area harboring snakes

GENERAL COMMENTS ON LIVE FENCING

Almost everyone interviewed was interested in "live fencing" and most had experimented with it and are using live poles around the home. In general it seems likely to expand; we are particularly interested in the extension of Acacia tortilis. However there are the following problems: 1. Hedges tend to provide cover for marauding birds--a great problem with sorghum and bulnish millet as well as snakes and vermin. 2. Hedges require considerable investment of time and effort and farmers fear land use planning as well as face labor budgeting problems.

TREES FOR HOMES AND FIELDS

SPECIES	ECOLOGICAL	SHAPE VALUE	WIND BREAK VALUE	FRUIT VALUE	WOOD/ FIREWOOD	AFFECT ON SOILS & CROPS	PROPAGATION METHOD
Combretum apiculatum "mubhondo"	heavy soils	good	good	none	excellent	no large affect	seedlings
Sectia brachypetala "mutondochuru"	heavy soils	very good	good	none	excellent	no large affect	seedlings
Unidentified "mugaragora"	heavy soils	excellent	good	none	fair	no large affect	seedlings
Gardenia app. "mutarara"	heavy soils	excellent	poor	none	little use	no large affect	seedlings
Azanza garckeana "mutohwe"	all	good	good	high	some important uses	very positive	truncheon & seedlings
Sclerocarya caffra "mupfura", please be aware that many different varieties exist	all	good	good	extremely high	very important	mild positive affect	truncheon & seedlings
Lannea stuhlmannii "musvimwa"	termitaria and rocks	good	good	fair	very important	mild positive affect	seedlings
Lannea discolor "mugan'acha"	all	good	good	fair	some uses	mild positive affect	truncheon or seedling
Berchemia discolor "munyii"	termitaria & wet areas	excellent	excellent	very high	very important	mild positive affect	seedlings
Adansonia digitata "mumbuyu"	heavy soils	good	very good	very high	fibers important from male trees	no large affect	transplanting natural seedlings

Strychnos cocculoides "mutamba"	light soils	good	good	high	some uses	no large affect	seedlings
Strychnos madagascariensis "mukwakwa"	light soil	good	fair	very high	quite important	positive affect	seedlings
Strychnos spinosa "muzumi"	light soils well watered (many died in drought)	good	good	very high	little use	no large affect	seedlings
Ficus spp. "muonde; mushavi; mudohonya; munhandavavira; musvita"	light soils in wet places	excellent	excellent	very high	important	very positive affects	seedlings & root cuttings; experiments needed
Parinari curatellifolia "muchakata"	light soils in wet places	excellent	excellent	very high	important	very positive affects	seedlings
Diospyros mespiliformis "musumha"	termitaria & wet areas	excellent	excellent	very high	important	very positive affects	seedlings

(Sources: International Council on Research in Agroforestry;
ENDA Agroforestry Woodland Pilot Project, Zvishavane)

D. Experiences in Kenya and Malawi

Kenya - Dorothy Leteipan, CARE-Kenya

CARE-Kenya has a staff of 56 in its agroforestry division, including 45 extension workers. Since its Agroforestry Extension Project began in 1983, 420 community nurseries assisted by CARE-Kenya, have produced 2,200,000 seedlings.

The NGO focuses its efforts on schools and community groups which have land, labor, motivation, and a permanent source of water. Their objective is to help people raise their own seedlings for sale and provides them with minimal materials such as a watering can, polyethylene tubing, buckets, small tools and wheelbarrows in a distribution strategy which allows the nursery to become self-sustainable rapidly. In areas where there is no reliable source of water, CARE-Kenya provides a cart for donkeys. The distribution of the seedlings is left up to the group following visits from the extension worker. Seminars for teachers and leaders of women's groups, training for forest technicians and technical assistants are also part of CARE's program.

The project has reached 257 women's groups and 163 primary schools in which 10,000 students have directly participated in nursery and tree planting.

Leteipan then discussed the tree species, such as Acacia albida, most commonly chosen to meet firewood, soil fertility restoration and soil erosion control, fruit production, windbreak, fencing and boundary demarcation and pole production needs of the farmers. Alley cropping, boundary planting, woodlots and fruit trees are the most common agroforestry interventions promoted by the project.

Kenya - Philip Ombidi, Diocese of Maseno South

Philip Ombidi described the reasons for deforestation in Kenya as:

- need for fuelwood, building materials, fencing and other requirements
- shifting cultivation
- bush fires
- increase of animal herds
- drought

He outlined the approaches of his organization in reaching farmers or other community groups (he noted that women's groups were more receptive than church congregations and traditional organizations), through farm visits, conscientizing, and the mass media.

The diocese assists communities to establish nurseries by providing seedlings in exchange for labor in the nurseries. The nurseries grow indigenous and exotic seedlings to meet the community needs for fuelwood, building materials, fencing, fruit, and other products.

At first, he said, the diocese had difficulties in finding acceptance in the rural communities with the result that the nurseries grew only gum and ornamental trees. But with workshops, seminars, visits and experimental plots, farmers began to change their attitudes and grow other species.

Malawi - Raymond Chimsale, Christian Service Committee

Raymond Chimsale of Christian Services Committee (CSC)-Malawi, spoke about his organization, outlining its structure and its approach to agroforestry.

Like CARE-Kenya, CSC waits for the community to approach them with their needs. He explained the application procedure and the manner in which project proposals must go through a CSC representative who takes the program to the District Commissioner for his approval so that conflicts with the government are avoided. The proposal then goes to the CSC screening committee and then an appraisal committee.

Chimsale emphasized that the proposed projects must have a self-help component to them e.g., that they mold their own bricks, in order for them to be considered by CSC. Once a project has been approved, CSC supplies only certain materials in all the projects, materials that the people demonstrate they will care for.

In agroforestry, CSC helps people establish their own nurseries having found that CSC nurseries were not properly managed. Trees are planted on church or communal lands, although more church groups are assisted than community groups not affiliated to the church due to the nature of CSC and their easy access to church congregations. CSC gives neither hoes nor polyethylene bags to the groups as a way to encourage self-reliance. Ninety percent of the people involved in projects assisted by CSC have their own hoes, said Chimsale.

E. Effects of Tree Diseases - Dr. J.M. Gopo, University of Zimbabwe

Dr. Gopo, Dean of Biological Sciences, University of Zimbabwe, gave a talk on how forestry efforts can be undermined if the trees become afflicted

with disease. He emphasized that disease-control must be incorporated with reforestation programs and that healthy seeds were needed to grow healthy seedlings and trees.

Dr. Gopo illustrated his point with a synopsis of his own research on microplasm, previously not considered pathogenic, which is responsible for "yellows disease". He showed some slides to demonstrate the symptoms of the disease which eventually leads to the death of the tree. In India, China and Japan, more than 200 species of trees are said to be affected by "yellows disease". In New York State, a whole white pine forest was destroyed. In Tanzania whole commercial forests have similarly been wiped out.

The disease was originally believed to be a result of insect infestations. Dr. Gopo revealed that the bite of an insect is enough to introduce the disease into the heart of the leaf but that insects themselves are not the cause of "yellows". Instead, the disease is caused by microplasm within the cell.

Leaves first turn yellow, then brown, eventually dropping off the tree altogether. "Yellows" spreads quickly from one tree to another and is not restricted to exotic pine trees. Cypress, maize, potatoes, and tomatoes can likewise be vulnerable. So far, the disease has proven to be resistant to antibiotics.

Dr. Gopo concluded that, while there is still a need for fast growing trees, there is a danger of bringing in unknown diseases with exotic trees and that diseases to which indigenous trees are resistant, may be hazardous to introduced species.

V. GROUP DISCUSSION
RELATING AGROFORESTRY SYSTEMS TO SOIL AND CLIMATE

Small group discussions were organized based on particular ecosystems within which participants work. The following are descriptions of the Government of Zimbabwe of five climatic zones related to farm land in Zimbabwe. It is important in introducing any particular agroforestry system to consider the kind of climate and soil in the area.

The five zones are:

Specialized and Diversified Farming Region
Intensive Farming Region
Semi-Intensive Farming Region
Semi-Extensive Farming Region
Extensive Farming Region

Farming Systems in Zimbabwe Related to Climatic Zones

I. **Specialized and Diversified Farming Region:** Rainfall in this region is high (more than 1000 mm per annum in areas lying below 1700 m altitude, and more than 900 mm per annum at greater altitudes), normally with some precipitation in all months of the year. Temperatures are normally comparatively low and the rainfall is consequently highly effective enabling afforestation, fruit, and intensive livestock production to be practiced. In frost-free areas plantation crops such as tea, coffee and macadamia nuts can be grown; where the mean annual rainfall is below 1400 mm, supplementary irrigation of these plantation crops is required for top yields.

II. **Intensive Farming Region:** Rainfall is confined to summer and is moderately high (750-1000 mm). Two sub-regions have been defined.

Sub-region IIa receives an average of at least 18 rainy pentads* per season and normally enjoys reliable conditions, rarely experiencing severe dry spells in summer. The region is suitable for intensive systems of farming based on crops and/or livestock production.

Sub-region IIb receives an average of 16-18 rainy pentads* per season and is subject either to rather more severe dry spells during the rainy season or to the occurrence of relatively short rainy seasons. In either event, crop yields in certain years will be affected, but not sufficiently frequently to change the overall utilization from intensive systems of farming.

III. **Semi-Intensive Farming Region:** Rainfall in this region is moderate in total amount (650-800 mm), but, because much of it is accounted for by infrequent heavy falls and temperatures are generally high, its effectiveness is reduced. This region will receive an average of 14-16 rainy pentads* per season. The region is also subject to fairly severe mid-season dry spells and therefore is marginal for maize, tobacco and cotton production, or for enterprises based on crop production alone. The farming systems, in conformity with the natural conditioning factors, should therefore be based on both livestock production (assisted by the production of fodder crops) and cash crops under good management on soils of high available moisture potential.

IV. **Semi-Extensive Farming Region:** This region experiences fairly low total rainfall (450-560 mm) and is subject to periodic seasonal droughts and severe dry spells during the rainy season. The rainfall is too low and uncertain for cash cropping except in certain very favorable localities, where limited drought-resistant crops can afford a sideline. The farming system, in accord with natural factors, should be based on livestock production, but it can be intensified to some extent by the growing of drought-resistant fodder crops.

V. **Extensive Farming Region:** The rainfall in this region is too low and erratic for the reliable production of even drought-resistant fodder and grain crops, and farming has to be based on the utilization of the veld (grass) alone. The extensive form of cattle ranching or game ranching is the only sound farming system for this region. Included in this region

are areas of below 900 m altitude, where the mean rainfall is below 650 mm in the Zambezi Valley and below 600 mm in the Sabi-Limpopo valleys.

***Note:** A rainy pentad is defined as the center one of three five-day periods (pentads) which together receive more than 40 mm rainfall and two of which receive at least 8mm of rainfall.

(Source: Map of Zimbabwe Natural Regions and Farming Areas, 2nd edition, Surveyor General, Harare, Zimbabwe, 1984.)

Participant Discussions

The participant groups focused as follows:

Group A: areas with moderate or high rainfall with intensive farming

Group B: areas with moderate rainfall with semi-intensive farming

Group C: areas with low or erratic rainfall with semi-extensive or extensive farming

The groups identified problems in these kinds of areas out of their experience and projected which of the agroforestry systems outlined in the presentation by Newton Spicer (See pages 7-17) might address their problems. In the plenary the variety of needs emerged. It was agreed by all that the solution of the groups was superficial since it was critical that the community itself go through a similar exercise to create an appropriate solution.

At a second session, the groups listed problems and the constraints to solving these problems.

GROUP A

Group A described the characteristics of Regions I and II as follows:

Region I - high rainfall, over 900 mm/year, with low temperatures production: maize, coffee, tea, livestock and afforestation

Region II - rainfall of 750-100 mm/year good for afforestation, crops and livestock

Priorities were identified as:

- soil infertility
- soil erosion
- fencing
- fodder
- food shortage
- timber
- fuel shortage

Group A listed the following problems and constraints:

- general inherent infertility
- social attitudes
- stream bank cultivation

- overgrazing
- cultural and social factors (i.e. belief in moving when soil fertility declines)
- cost of fencing materials
- lack of community organization and participation
- land availability
- attitudes of people
- species
- lack of technical know-how
- shortage of draught power
- cutting down fruit trees for fuelwood
- rising costs of commercial timber
- unavailability of alternative energy sources
- socio-cultural beliefs

GROUP B

Group B described Region III as: flat land, sandy and clay soil; rainfall of 650-80mm/year; altitude of 1200m; infrastructure adequate although could be improved; cash crops (maize, cotton, tobacco, peanuts, wheat); stable food (maize, millet); livestock (cattle, pigs, donkeys, goats, poultry); income from cash crops, working in towns and farms.

Region III's priorities were identified:

- water
- fencing
- roads
- classroom extension
- soil fertilities

- firewood
- soil conservation
- wind breaks/shades

The constraints Group B found were:

- planning and organization
- lack of inputs
- lack of awareness of solutions
- lack of water

GROUP C

Group C described Regions IV and V as: semi-extensive farming region, low rainfall, maximum 650 mm/year; periodic seasonal drought, high temperatures, mean 24 degrees Celsius, unsuitable for cropping, altitude 900 m, soils sandy, red, hard, infertile (granitic and doloritic soils).

Priority problems faced by Regions IV and V are:

- lack of water
- erosion
- soil infertility
- land management; grazing management
- deforestation
- high temperatures
- termites
- lack of general development

Group C identified the constraints facing the regions as:

- socio-cultural beliefs
- heritage of colonialism (colonialist mentalities) i.e., want to grow exotic trees instead of the more practical indigenous species
- lack of capital
- lack of coordination of agencies at grass-roots level
- lack of maintenance of existing catchments (i.e., dams - siltation)
- problem of transferring technical information

VI. NGO INITIATIVES IN ZIMBABWE 1986-1988

Before discussing follow-up to the NGO workshop, a review of initiatives to date was suggested. The mandate for the National NGO Workshop on Agroforestry emerged from the meetings in Harare and in Masvingo in 1986 (see page 1). The recommendations of these two meetings are listed below. Those recommendations carried out are indicated by an asterisk (*) those in process by a plus sign (+); those not carried out by a minus sign (-).

* Identify and involve NGOs and relevant government departments concerned with conservation
+ Determine means of communication
* Share information about ongoing programs
* Committee to propose content for conference
+ Suggest ways to effect implementation of national conservation strategy
+ Promote meetings of NGOs at district, provincial and national levels
+ Identify resources needed to implement objectives

+ NGO Subcommittee to be link between government and NGO community
+ To organize an NGO workshop
- Disseminate information on forestry activities
+ To determine present forestry activities of NGOs
+ To coordinate and encourage cooperation with local communities, other NGOs and government
+ To increase participation in forestry activities with NGO community through NGO training
- To collect technical information relating to forestry research and development activities

Following are suggestions by the workshop for future activities:

- NGO Environmental Subcommittee (see page 1) should continue to exist, although at present it is too Harare-oriented. NGOs in Mutare and Bulawayo are unable to attend all its meetings. Should hold meetings in different city centers i.e. Mutare, Bulawayo, Masvingo, etc.
- Subcommittee should look into ways of decentralization.
- AGRITEX and Forestry Commission should be invited to the Subcommittee's meetings.
- Subcommittee should look into changing its name: "subcommittee" inappropriate since it is not clear to what it is related.
- Subcommittee should determine its position vis a vis VOICE's Development Forum.
- Subcommittee should look into the production of a newsletter based on reports sent in by NGOs on activities related to agroforestry; could be funded by a subscription or registration fee.
- Subcommittee should be represented on the National Agroforestry Steering Committee.
- Field trips/days should be promoted in regions for NGOs and others to attend; could be organized by a decentralized structure of NGOs.

VI. EVALUATION BY PARTICIPANTS AND CONCLUSIONS

At the end of the workshop, the participants were asked what they found to be the most useful and the least useful aspects of the workshop. A summary of the comments follows.

Most Useful

A number of participants commented on benefiting from the general exposure to agroforestry which the workshop offered regarding the importance of

agroforestry and trees. "Before, I did not care for them", wrote one participant. Slides presented by Newton Spicer, AGRITEX, and Dorothy Leteipan, CARE Kenya, appeared to be especially of value to several participants while others commented on the useful participation of other NGOs and the sharing of experiences.

Least Useful

Only half a dozen participants remarked that they found something to be least useful. This usually related to spending too much time on something they felt was not merited. In particular, the short trip around the Chitepo nursery and the time speakers spent on describing the structures of their organizations were mentioned. Other participants commented that "late-comers" and "missing NGOs" were least useful to them.

Recommendations

It was unanimously agreed that Chitepo Training Center has accommodation facilities that do not warrant complaint.

Length of Workshop

The majority of participants (13) felt that the length of time was appropriate; 5 felt it was too long; and 4 felt it was not long enough. This appears to be a reflection of the different levels of knowledge and/or exposure to agroforestry. Those who felt there was much more to learn, wanted more time. Those who felt it too long, neglected to say why they felt so.

Resource People

All participants commented on the high calibre of the resource people and felt that they had played an essential role in the workshop. A few participants added that more resource people were needed, i.e., local personnel in forestry and representatives from other neighboring countries.

Workshop Content

Some of the participants felt that the flexible structure of the workshop precluded an optimal productivity of the workshop. Other participants focused their comments on the vacuum the workshop filled in the campaign for agroforestry in Zimbabwe, noting how the workshop enabled them to identify agroforestry activities in their areas and how to improve upon them.

The failure to realize the objectives of developing micro projects and a mechanism for networking was pinpointed by some but generally the comments reflected an overall satisfaction with the content of the workshop.

Other Comments

Most of the other comments referred in some way to the need for continued activities in agroforestry collaboration amongst NGOs with a greater scope:

- need to involve external NGOs
- need for NGOs to organize their own workshops with the Subcommittee providing facilitators
- need to have good follow-up mechanisms
- need to have more time and more field research
- need for participation of small farmers and peasants

Conclusions

This workshop was the first opportunity in Zimbabwe to get NGOs involved in environment and exchange ideas about agroforestry. While two of the three objectives outlined for the workshop well before it was held, failed to be realized, i.e., to plan community micro projects in agroforestry relevant to specific agro-ecological zones, and to establish a mechanism for networking in agroforestry activities, the workshop did succeed in getting a high level of participation from NGOs in Zimbabwe to address the issue of agroforestry. Government and University participants were an important part of the process, as were NGOs from outside of Zimbabwe.

It was perhaps a little over ambitious to expect a workshop which could create micro projects and a networking mechanism at this point in time. The first objective, to acquaint the participants with various agroforestry systems, however, was unquestionably reached, as can be seen by the participant evaluations of the workshop.

A number of NGOs and individuals have been aware of the need to act cooperatively with respect to the deforestation problem in Zimbabwe. However, this workshop continued the process initiated at the Harare meeting in 1986. Much still has to be done, but NGOs in Zimbabwe are on their way to taking some action.

APPENDIX A

LIST OF PARTICIPATING ORGANIZATIONS

Adult Literacy Organization (ALOZ)
AGRITEX
Association of Women's Clubs (AWC)
CARE-Kenya
Catholic Development Commission (CADEC)
Christian Care
Christian Service Committee, Malawi
CODEL (Coordination in Development)
Diocese of Manicaland, Anglican Church
Diocese of Maseno South, Kenya
ENDA Zimbabwe
Forestry Commission, Zimbabwe
Glen Forest Training Centre (GFTC)
Kwirire Co-op
Manicaland Development Association (MDA)
Nyanga Development Project (NDP)
Organisation of Collective Cooperatives in Zimbabwe (OCCZIM)
Organization of Rural Associations for Progress (ORAP)
Silveira House
Tree Society
University of Zimbabwe
Voluntary Organisations in Community Enterprise (VOICE)
Zimbabwe Foundation for Education with Production (ZIMFEP)
Zimbabwe Women's Bureau

Steering Committee For Workshop

Clare Delbridge, VOICE
Peter Garwe, CADEC
Charles Gore, ENDA
Dorothy Leteipan, CARE Kenya
Simbarashe Muzuva, VOICE
Newton Spicer, AGRITEX
Robert Thelin, Christian Care
Helen Vukasin, CODEL

APPENDIX B

PROGRAM OF THE WORKSHOP

AGROFORESTRY WORKSHOP
CHITEPO TRAINING CENTER
MANICALAND, ZIMBABWE
JUNE 7-12, 1987

7th June, 1987

18:00 Registration of participants
19:00 SUPPER
20:00 Welcome address by representative of the Workshop Organizing Committee
- workshop goals and objectives
- introduction of participants
- formation of working groups

8th June, 1987 Chair: Peter Garwe

08:00 General orientation to Agroforestry Systems: Newton Spicer, AGRITEX
09:00 Exposure Programme/Field Trip - pack lunch
19:00 SUPPER
20:00 International Development Research Center Films

9th June, 1987 Chair: Peter Garwe

08:00 Working Groups Meet to Discuss Field Trip
09:00 Plenary Session - Field Trip Reports from Working Groups
10:00 TEA
10:30 Field Trip Reports and Discussion
13:00 LUNCH

Chair: Charles Gore

14:00 Opening and Description of Agroforestry Commission:
Mr. R.H. Vaughn-Evans, AGRITEX, Deputy Director
15:00 TEA
15:30 Country Reports: Philip Ombidi, Anglican Diocese, Kenya
Dorothy Leteipan, CARE, Kenya
- Slide Presentation
19:00 SUPPER
Reception

10th June, 1987 Chair: Charles Gore

08:00 Plant Pathology of Pines (Yellows): Dr. J.M. Gopo, Chairman, Department of Biology, University of Zimbabwe
09:00 Country Reports: Raymond Chimsale, Christian Service Committee, Malawi
10:30 TEA
11:00 Zimbabwe Agroforestry Project: Ian Scoones, Imperial College, London and Mathou Chakavanda, Zishavane

- Discussion
- Plenary Session

12:30 CODEL, Inc. (Coordination in Development) Description and Resource Materials: Helen L. Vukasin
13:00 LUNCH
14:00 Visit to Nursery
15:00 TEA
15:30 Technical Address on Agroforestry Systems: Newton Spicer, AGRITEX
- Slide Presentation
19:00 SUPPER

11th June, 1987 Chair: Dorothy Leteipan

08:00 Introducing and Promoting Agroforestry in Communal Areas: Working Groups
- Questions for Discussion
- Description of Natural System
- Problems and Constraints in Area
- Application of Agroforestry Systems
- Steps Toward Design of Agroforestry Projects

10:00 TEA
10:30 Prepare Report
12:00 Plenary Session
13:00 LUNCH
14:00 Continuation of Small Group Discussion
15:00 TEA
15:30 Plenary Session for Reports
19:00 SUPPER and Local Performance

12th June, 1987 Chair: Robert Thelin

08:00 Plenary: Written Evaluation
09:00 Report from Sub-Committee
- Discussion
- Evaluation: Oral

10:00 Closing: Forestry Commission
10:15 Acknowledgments
10:30 TEA
11:00 Participants Leave for Harare

APPENDIX C

CHOICE OF SPECIES FOR AGROFORESTRY

It is important to recognize that the choice of species for Agroforestry depends to a large extent on the ecological conditions of the site in question. Planting species unsuited to the local ecology is not economically cost-effective and can lead to serious environmental degradation. It is also important to consider the mutual compatibility and non-competitiveness of the various agricultural and tree species to be introduced. The different components of an Agroforestry system should be complementary over all stages of growth and maturity.

In cases where forestry is the dominant land use, the choice of agricultural crops is decided by which species can grow under the prevailing conditions without posing a threat to the woody perennials. In cases where farming is the dominant land use, the agricultural component of Agroforestry is largely dictated by local socio-economic factors, the question of species choice rests mainly with the woody component. Special regard should be given to avoiding species that pose problems of competition for water, nutrients and solar energy. In addition to commercial usefulness, the ideal agroforestry tree species should have the following important characteristics:

- they should be amenable to early wide espacement
- they should possess self-pruning properties
- if not self-pruning, they should be able to tolerate relatively high incidences of pruning, i.e. their photo-synthetic efficiency should not significantly decrease with heavy pruning
- they should have a low crown diameter-to-bole diameter ratio i.e. the width of their crowns should be small relative to bole diameter
- they should be light-branching in habit
- they should be tolerant of side-shade, if indeed not of full overhead in the early stages of growth
- their phyllotaxis should permit the penetration of light to the ground
- their phenology, particularly with respect to leaf flushing and leaf fall, should be advantageous to the growth of the annual crop in conjunction with which they are being raised
- their rate of litter fall and litter decomposition should have positive effects upon the soil
- their "above ground" changes over time in structure and morphology should be such that they retain or improve those characteristics that reduce competition for solar energy, nutrients and water
- their root systems and root growth characteristics ideally should result in the exploration of soil layers that are different from those being tapped by the agricultural species
- they should be efficient nutrient pumps.

Source: UNEP, Environmental Guidelines for Agroforestry Projects, UNEP Environmental Management Guidelines, No. 11.

APPENDIX D

SOME DESIGN CONSIDERATIONS FOR AGROFORESTRY PROJECTS

Agroforestry projects can be designed to improve or transform existing land use practices. Agroforestry is also useful as an interim land use in, for instance, the early stages of forest plantation establishment (e.g., Taungya system in S.E. Asia).

Whatever the rationale of Agroforestry projects, the decision of how to arrange plants over time and space is crucial to success. The three basic types of plant arrangement are mixed cropping, zonal cropping and rotational cropping. Zonal agroforestry describes a situation where plants are arranged in zones (strips, bands, or other geometric shapes) so that there is some but not excessive interaction between species.

The decision to use any of these methods depends primarily on the degree of compatibility of species in terms of resource use and the ecological setting. Where species are highly complementary, mixed cropping is viable. If the biological interaction is not as favorable (competition for resources occurs) some form of zoning should be considered. The exact configuration of zones depends on the degree of positive interaction. When the nature of the interaction is not known a zonal system allows for a less committee approach. In instances where special exhibit a somewhat negative biological interaction, appropriate management techniques such as time-of-planting, time-of-harvesting, training and pruning, can be implemented.

In deciding on spatial and temporal arrangements, it must be noted that tree species often require more maintenance (especially in the early stages of life) and land preparation than do agricultural crops. Special consideration should be given to arranging trees in a manner suited for soil and water conservation. Planting the wrong tree in the wrong place can lead to disastrous ecological effects.

- genetic heritage; it is important not to destroy ecological niches and biotypes when transforming one ecosystem into another
- ground preparation; care must be exercised to avoid destroying the soil structure; haphazard movement of machinery should be avoided
- the construction of roads and firebreaks should be planned to minimize surface water flow erosion and other damage
- the project should be tailored to the needs of the local population to ensure their participation
- pest management; an integrated approach using a combination of biological mechanical and chemical means to combat pests is advisable; species should be pest resistant
- fertilizers should be used with care; minimum dosages should be used and never during rainy seasons

Finally, with regard to the special care and knowledge required in growing and supporting trees, farmers will have to be convinced of the benefits of Agroforestry. Projects will fail without the support of those for whom they are intended.

(Source: UNEP Environmental Management Guidelines, No. 11)

APPENDIX E

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PLANNING COMMITTEE

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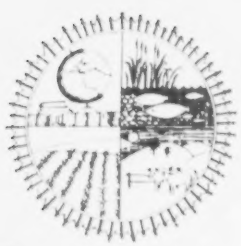
Association of Women's Clubs (AWC)
Catholic Development Commission (CADEC)
Environment and Development in the Third World (ENDA) Zimbabwe
Organization for Rural Agricultural Progress (ORAP)
Voluntary Organizations in Community Enterprise (VOICE)
Zimbabwe Foundation of Education and Production (ZIMFEP)



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